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Local income and employment impact of universities: the case of Izmir University of Economics

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This paper conducts a case study to estimate the direct, indirect, and induced economic impacts of Izmir University of Economics on local income generation and job creation in Izmir Metropolitan Area. Data on university expenditures are extracted from the University's financial statements. Faculty and students are surveyed to collect data on their average monthly expenditures. An economic impact analysis is implemented to estimate direct effects, induced effects, and Keynesian type income-expenditure multipliers. Study results indicate that Izmir University of Economics is a prominent economic force in local income and employment creation.

Keywords*: University impact analysis, regional development, regional income multipliers, Keynesian income multipliers, Keynesian expenditure multipliers*

1. Introduction

Universities are often significant economic units in terms of income generation and employment creation. Besides their unquestionable role in knowledge generation and transmission, universities act as a large employer and consumer of goods and services and their economic impact on the local community are usually quite significant. Thereby, it is of great importance to assess and acknowledge the economic impact of a university on its local community. The significance of the issue has necessitated a need to conduct a case study in order to estimate the expenditure impact of Izmir University of Economics on its local economy in terms of income and employment generation.

Universities contribute to the economy in which they are located through direct, indirect, and induced effects on local income generation and employment creation. Direct effects arise from University's direct expenditures on operations and maintenance, and from the expenditures of enrolled students and visitors. Indirect effects are the consequences of spin-offs in demand, which are triggered by the direct expenditures of the university, students, and visitors. Induced

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effects are the result of the university's spending on wages and salaries that induce a continuous chain of proportionate re-spending and employment according to the marginal propensity to consume. This induced effect is the well-known "Keynesian multiplier process". Once the university pays its employees, this constitutes the direct effect. These employees in turn spend a proportion of their salaries on local goods and services, thereby generating indirect effects. A proportion of these local sales are paid out as wages to local employees and profits to local business owners. A proportion of this income is in turn re-spent on local goods and services, creating induced effects (Lantz *et al.*, 2002).

Within university impact studies, two broad approaches that aim to estimate regional multipliers can be identified. These two approaches are the Keynesian income-expenditure approach which aims to estimate Keynesian-type income-expenditure multipliers and the input-output approach which aims to estimate sectoral output, income and employment multipliers.

A demand side approach to university impact analysis is based on the estimation of Keynesian-type income-expenditure multipliers. The multiplier process is based on the assumption that expenditure by one person represents income for another person and that an increase (decrease) in income of one person results in an increase (decrease) in total income in the economic system (in this case the local economy) rising (falling) by some multiple of the initial income increase (decrease). The expansionary process operates only when there are some unemployed resources available within the economic system, otherwise the rise in demand would be met by rising prices and/or an increase in imports to the system. The size of the induced or multiplier effect depends on the extent to which income leaks from the system at each round of expenditure through direct and indirect taxation, saving, and importation of goods and services, and the extent to which income gains (losses) replace (are compensated by) changes in transfer payments, such as unemployment or supplementary benefits (Lewis, 1988).

An alternative approach to measuring the economic impact of a university is to construct input-output linkages between the university and the local economy. The input-output table is based on the equilibrium accounting notion that gross output of each sector is either sold to other sectors such as intermediate inputs, or it represents an element of final demand (e.g. investment, consumption, or export). Input-output models are constructed primarily because they provide a detailed industry-by-industry breakdown of the predicted effects of changes in demand. Input-output models can be used to estimate sectoral output and employment multipliers (Armstrong and Taylor, 2000).

Despite the widespread use and popularity of regional multiplier analysis, this approach in measuring economic impacts has several major weaknesses. First, regional multiplier analysis does not account for capacity constraints. If a regional economy has capacity constraints, producers may respond to an increase in demand by raising their prices rather than by increasing output. Thus, expenditure impact may have little or no effect on regional economy (Armstrong and Taylor, 2000).

Next, regional multiplier analysis does not allow for interregional feedback effects. An increase in regional income causes an increase in imports, which are another region's exports. This would raise income in other regions, which in turn increase their own exports. However, such interregional feedback effects are not allowed for in regional multiplier analysis (Armstrong and Taylor, 2000).

Finally, regional multiplier analysis does not account for negative externalities such as pollution or traffic congestion that result from the presence of a university (Armstrong, 1993). Despite these criticisms, regional multiplier analysis, which is used by many researchers, serves to be a useful tool in economic impact analysis.

Given this background, this study presents estimated answers for the following questions:

1. What is the impact of Izmir University of Economics (IUE) on the gross output of the area?
2. What is the impact of the IUE on the disposable incomes of the inhabitants of the area?

2. Literature Review of University Impact Analysis

Many studies have aimed to estimate the spending impact of universities on the local economy. The majority of these studies incorporate a Keynesian multiplier analysis. Lewis (1988) assessed the direct, indirect, and induced effects of the Polytechnic Wolverhampton in England, on the local economy in terms of income and employment generation using an input-output model. The study estimated a multiplier of magnitude 1.027 (very close to 1), indicating that the induced effects of the university on the local economy are relatively small.

Bleaney *et al*. (1992) estimated gross output multiplier and disposable income multiplier for the University of Nottingham in England. The authors developed and estimated a model that accounted for induced effects. They estimated the Keynesian multiplier for gross output as 1.259 and the Keynesian multiplier for disposable income as 1.561. The results suggest that the University has a non-marginal impact on its local economy.

Using the model built by Bleaney *et al*. (1992), Armstrong *et al*. (1994) estimated local income multipliers for Lancaster University for the fiscal year 1991-92. This study differs from the previous one as it examines construction expenditures at the University separately from annual operation expenditures. In data collection, contrary to the previous studies which estimated the proportion of goods and services bought from outside by the University from a sample of invoices, Armstrong *et al*. (1994) surveyed all the invoices. Detailed surveys were also undertaken about the residential locations of all staff and students. The results of the study indicated that direct expenditures of the University amounted GBP 67.93 million and direct employment was 1 863 jobs. Local gross output multiplier, local disposable income multiplier and local employment multiplier were estimated as 0.87, 0.439, and 1.098 respectively, which can be considered large for an economy as small and as open as Lancaster District.

By extending the models used by Bleaney *et al*. (1992) for Nottingham University, and by Armstrong *et al*. (1994) for Lancaster University, Huggins and Cooke (1997) estimated local income and employment multipliers for Cardiff University for the fiscal year 1994-95. Gross local output for Cardiff and South East (SE) Wales were estimated as GBP 97 million and GBP 102 million respectively, while local disposable income for Cardiff and SE Wales were estimated as GBP 52.7 million and GBP 55 million respectively. The multiplier for gross local output was estimated as 1.51 for Cardiff and 1.52 for SE Wales while the multiplier for local disposable income was estimated as 1.45 for Cardiff and 1.46 for SE Wales. The results indicate that the university has a non-marginal impact on both the economies of Cardiff and SE Wales.

Along with the traditional methodology, many studies use input-output modeling in estimating income and employment multipliers. Arik and Nsiah (2004) estimated the economic

impact of Middle Tennessee State University on the economies of Nashville Metropolitan Statistical Area and Rutherford County for the fiscal year 2003. Carroll and Smith (2006) studied the economic impact of Bowling Green State University's expenditures on the local economy for the fiscal year 2002.

In Turkey, only a few studies have been carried on to estimate the spending impacts of a university on its local area; however these studies are far from incorporating the induced effects since they do not include an estimation of a multiplier. Atik (1999) assessed direct and indirect effects of Erciyes University on the local economy for the academic year 1997-98. Direct effects were estimated as TRY 3.6 million and 2 323 job creation. Indirect effects were estimated as TRY 11.6 million and 5 362 job creation. Erkekoglu (2000) estimated direct and indirect effects of Sivas Cumhuriyet University on the local economy for the academic year 1998-99. Direct effects were estimated as TRY 4.6 million and 2 170 job creation while indirect effects were estimated as TRY 10.8 million and 2 794 job creation. Another study was carried on by Gorkemli (2009) to estimate direct and indirect effects of Selcuk University on its local economy for the academic year 2002-2003. Direct effects were estimated as TRY 41 million and 4 205 job creations while indirect effects were estimated as TRY 13 million and 559 job creations.

3. Study Area

This study illustrates the expenditure linkages between Izmir University of Economics (IUE) and its metropolitan economy in the year 2004. The objective of this study is to assess the impact of the very presence of the University in the Izmir Metropolitan Area in terms of local income and employment generation.

IUE was established as a "public corporation" on April 14, 2001 by the Izmir Chamber of Commerce Education and Health Foundation with the initiative of Izmir Chamber of Commerce. IUE is located in Balcova municipal district within the city of Izmir. As of June 2005, IUE has 5 faculties, 16 departments, 2 vocational schools, and 1 graduate school.

The study area, Izmir Metropolitan Area, is comprised of the municipal districts of Konak, Bornova, Balcova, Karsiyaka, Cigli, Narlidere, Guzelbahce, Urla, Gaziemir, Kemalpasa, Aliaga, Foca, Menemen, Torbali, Bayindir, Selcuk, Seferihisar, and Menderes. Almost all full-time faculty and staff reside in the Izmir Metropolitan Area. Annual net payroll for these employees in 2004 is approximately TRY 4.3 million. Assuming that most expenditure is at place of residence, a considerable direct income injection to the metropolitan economy is expected.

Another economic linkage is through purchasing. University direct expenditure in the metropolitan area is estimated as TRY 13 million out of annual gross purchasing expenditure of TRY 14.5 million. In addition to generating direct income injection to the economy, the University provides direct employment creation through its full-time academic staff, part-time academic staff, and administrative staff. In the Spring semester of the 2003-2004 academic year, the University employed 142 full-time academic staff, 177 part-time academic staff, and 53 administrative staff. In the Fall semester of the 2004-2005 academic year, the University employed 198 full-time academic, 180 part-time academic, and 66 administrative staff.

The University enrolls a significant number of students whose expenditure makes a prominent contribution to the service sector in Izmir. In the year 2004, the undergraduate

students resided in Izmir for a minimum of 30 weeks. The number of students enrolled in the University is presented on Table 1.

Table 1. Number of students enrolled in Izmir University of Economics

	Undergraduates	Vocational School	Graduates
2003-2004 academic year Fall semester	1 305	1 027	149
2003-2004 academic year Spring semester	1 293	997	179
2004 Summer School	313	181	-
2004-2005 academic year Fall semester	2 313	983	211
2004-2005 academic year Spring semester	2 309	965	232

Source: Records of the Registrar's Office.

4. Methodology

The analysis of expenditure linkages of the University with its metropolitan area is undertaken using the model refined by Huggins and Cooke (1997) to measure the economic impact of the Cardiff University on the local economy. This is a previously defined model first by Bleaney *et al*. (1992) for Nottingham University and later by Armstrong *et al*. (1994) for Lancaster University. The analysis in this study is confined to a single base year of 2004. However, it is important to note that the full impact of any expenditure injection is likely to occur over a number of years.

It should be noted that economic impact studies have to rely heavily on assumptions which will remain open to questions or contradictions. Economic impact analyses are practical applications and in order to arrive at some concrete conclusions, a number of such assumptions have been made. These assumptions are made clear at all times throughout this study.

In an economic impact study, the definition of income is an issue of importance. If income is defined as Gross Local Output (Y), then the total value of additional educational and other services accruing to the Izmir Metropolitan Area as a consequence of the University's presence has to be counted. Thus, one would be measuring the University's impact on the gross output of the area. Although this would be a good measure for assessing the weight which the University adds to the local economy, a large slice of this money has no local effects, as it simply flows back to the government in the form of income tax and social security contributions. One may, therefore, include the impact on total disposable income, which would equal additional gross output, less additional taxes, plus additional subsidies and transfer payments (Bleaney *et al.*, 1992; 307). Therefore, separate estimates are calculated for gross local output (Y) and local disposable income (D).

Initial Injection by the University (Expenditure Base)

The model defined by Huggins and Cooke (1997) involves a number of stages. At the outset, the model simply involves estimating the size of the initial, direct monetary injection into the local economy by the University.

This expenditure base is given as:

$$E = L + G \tag{1}$$

where E = expenditure base, L = labor services bought by the University, G = goods and services bought from outside by the University. E excludes depreciation and pensions. L is the net

payments and does not include the payments made to part-time academic staff, who resides outside of the Izmir Metropolitan Area or tax payments to government.

First-round Gross Local Output (Direct Monetary Injection)

$$Y_1 = L + A + hG \text{ measured at market prices} \quad (2)$$

where Y_1 = first-round GLO, and h = the proportion of G generated locally, A = the additional labor incomes of University employees.

First-round Local Disposable Income

This is given as:

$$D_1 = (1 - t)\,(Y_1 - hiG) \quad (3)$$

where D_1 = first round impact on disposable incomes of local residents, i = indirect tax rate (e.g. VAT), t = a direct tax rate.

Second-round Gross Local Output (Associated Monetary Injection)

In the second round, student expenditures are included as associated monetary injections into the local economy.

This is given as:

$$Y_2 = vZ + wcD_1 \quad (4)$$

where Z = total spending by students, v = proportion of student expenditures made on locally produced goods and services, w = proportion of staff spending on locally produced goods and services, c = proportion of additional staff income consumed (the remainder is being saved) – the marginal propensity to consume.

Second-round Disposable Income

This is given as:

$$D_2 = (1 - t)\,(1 - i)Y_2 \quad (5)$$

Assuming once more a rate of local re-expenditure of w, a third round of expenditure is obtained as:

$$Y_3 = wcD_2 = wc(1 - t)(1 - i)Y_2 \quad (6)$$

$$D_3 = (1 - t)(1 - i)Y_3 = wc(1 - t)^2(1 - i)^2Y_2 \quad (7)$$

Again assuming once more a rate of local re-expenditure of w, a fourth round of expenditure is obtained as:

$$Y_4 = wcD_3 = wc(1 - t)(1 - i)Y_3 = w^2c^2(1 - t)^2(1 - i)^2Y_2 \quad (8)$$

$$D_4 = (1 - t)(1 - i)Y_4 = wc(1 - t)^2(1 - i)^2Y_3 = w^2c^2\,(1 - t)^3(1 - i)^3\,Y_2 \quad (9)$$

The Full Multiplier for Gross Local Output (all rounds)

After all rounds of the multiplier process, the process is assumed to converge to final increments to gross output and disposable income of Y_f and D_f respectively. The gross output multiplier is then defined as

$$Y_f / Y_1 = (Y_1 + Y_2 + Y_3 + \ldots.) / Y_1$$

$$= 1 + (1 + wc(1 - t)(1 - i) + w^2c^2(1 - t)^2(1 - i)^2 + \ldots.) \, Y_2 / Y_1$$

$$= 1 + Y_2 / ([1 - wc(1 - t)(1 - i)] \, Y_1) \quad (10)$$

Y_f = the final Gross Local Output (after all rounds of the multiplier process).

The Full Multiplier for Local Disposable Income (all rounds)

This is given as:

$$D_f / D_1 = (D_1 + D_2 + D_3 + \ldots.) / D_1$$

$$= 1 + (1 - t)\,(1 - i)\,(1 + wc(1 - t)(1 - i) + \ldots..) \, Y_2 / D_1$$

$$= 1 + (1 - t)\,(1 - i) Y_2 / ([1 - wc(1 - t)(1 - i)] \, D_1) \quad (11)$$

“ D_f = the final disposable income (after all rounds of the multiplier process).

These are typical Keynesian multipliers, calculated as the ratio of the final to the first-round increment to income.

5. Data

Table 2 sets out the main components of expenditure associated with the annual operation of the University in the fiscal year (FY) 2004.

In FY 2004, the University paid about a total of 5 million TRY of wages and salaries to full-time academic, part-time academic, and administrative staff. The values show the net payments and exclude the payments made to part-time academic staff that resides outside of the Izmir Metropolitan Area and tax payments to government.

In FY 2004, the University purchased goods and services worth of 14.6 million TRY from 261 suppliers in Izmir and 45 suppliers from elsewhere. In order to assess the extent of purchasing in Izmir and elsewhere, all of the invoices were examined to determine the value of goods and services and the location of the supplier. The results revealed that approximately 87% of goods and services were purchased in the Izmir Metropolitan Area and 13% elsewhere. In order to establish the economic impact of staff employment and spending in the Izmir Metropolitan Area, staff details on residence were extracted from personnel database. Analysis revealed that 99% of all University staff resides within the Izmir Metropolitan Area. To estimate the proportion of university staff expenditure that is spent in Izmir, a sample survey of 80 academic and administrative staff was undertaken. The composition of the sample survey was as follows: 25% full-time Turkish academic staff, 20% foreign academic staff, 20% Turkish instructors from School of Foreign Languages, 15% part-time Turkish instructors, 10% research assistants and instructors and 10% administrative staff. The results of the survey indicated that 95% of the staff expenditure took place inside the Izmir Metropolitan Area and only 5% is spent outside the Izmir Metropolitan Area.

In order to assess student expenditure in Izmir, a questionnaire survey of 200 students were undertaken. The survey yielded that the average total monthly expenditure of students in the year 2004 was 877 TRY per student and 92% of this took place within the Izmir Metropolitan Area. In this study, all the full-time students are considered as “net new”, as it is assumed that they would be attending private universities in other cities if IUE had not existed. Total student expenditure in the year 2004 was calculated by multiplying the average weekly expenditure per student by the number of students and number of weeks in

each academic semester. The highest five and the lowest five values are excluded from the calculations.

Table 2. Direct Expenditure by Izmir University of Economics in Fiscal Year 2004.

	TRY (thousand)
University staff salaries and wages	
Full-time academic and administrative staff	4 252
Part-time academic and administrative staff	759
Total salaries and wages	5 011
Non-wage expenditures	
Conferences, seminars, panels symposiums	70
Photocopy, stationery goods, publications	150
Food, catering	50
Clothes	1
Health	4
Internet	5
University promotion	218
Sports events	116
Rent, heat, light, water and power	1 087
Transportation and insurance	112
Repairs and general maintenance	102
Financial expenses	384
Consultancy	180
Auditor's remuneration	25
Transportation allowance	45
Security	80
Office fixtures and equipment	1 544
Laboratory, TV and studio fixtures	94
Computer programs fixtures	235
Vehicle purchases	175
Library fixtures	12
Building and land purchases	8 406
Other education, management, operation and fixtures related expenses	1 471
Total non-wage expenditure	14 565
Depreciation	628
Total expenditure by Izmir University of Economics	20 204

Source: Registrar's Office, Financial Statements of the University for Fiscal Year 2004

6. Results

The estimation of the model consists of using the coefficients and the variables generated from various sources as listed. All data refers to TRY000s.

Initial Injection by the University

$$E = L + G \tag{12}$$

L = total labor costs

L = 5 011

G = expenditure on goods and services - depreciation

G = 14 565

E = 5 011 + 14 565 = 19 576

First-round Gross Local Output (Direct Monetary Injection)

$$Y_1 = L + hG \text{ measured at market prices} \quad (13)$$

h = the proportion of G generated locally = (13,143/15,193) = 0.87 for the Izmir Metropolitan Area.

$$Y_1 = (5\ 011) + (0.87)(14\ 565) = 17\ 683$$

First-round Local Disposable Income

$$D_1 = (1 - t)\ (Y_1 - hiG) \quad (14)$$

t = a direct tax rate = 0.3 (taken from University internal financial data), i = indirect tax rate = 0.15. i is calculated by using a sub-sample survey from the student expenditure survey that represents the population. A sample of 7 surveys is taken in the expenditure range of 0-500 TRY, 14 in the range of TRY 500-1 000, 6 in the range of TRY 1 000-1500, 2 in the range of TRY 1 500-2 000 and 1 in the range of TRY 2000+, which in total consists of 30 surveys. The result of the sub-sample survey indicated that 70% of the student expenditures are for the goods and services that are subject to 18% VAT and 30% of the expenditures are subject to 8% VAT. Thereby, i is calculated as a weighted average of the indirect tax rates. i = (0.7)(0.18) + (0.3)(0.08) = 0.15

Therefore:

$D_1 = (1 - 0.3)\ (17\ 683 - (0.87)(0.15)(14\ 565)) = 11\ 047$ for the Izmir Metropolitan Area.

Second-round Gross Local Output (Associated Monetary Injection)

$$Y_2 = vZ + wcD_1 \quad (15)$$

Z = total spending by students. Weekly student spending = TRY 220 per student. For the purposes of this study, graduate students are excluded, since most are from locality and would already be in residence. Moreover, Summer School enrollment has been excluded for the purposes of using the most conservative measures, since students attending the Summer School may leave the Metropolitan Area and spend their money in recreational areas after attending the classes. 4 weeks from the 2003-2004 academic year Fall semester, 15 weeks from the 2003-2004 academic year Spring semester and 13 weeks from the 2004-2005 academic year Fall semester, for a total of 32 weeks are included in the calculation. Therefore Z = [(220)(4)(2 332) + (220)(15)(2 290) + (220)(13)(3 296)] = TRY 19 035 720 (approx.)

v = proportion of student expenditures on goods and services in the locality. From the sample survey, it is estimated that only 8% of student expenditures took place outside of the Izmir Metropolitan Area. Student spending in the University is not deducted from the student expenditures since the University buys catering and stationery services from outside. Therefore, student expenditures within the University do not cause the incidence of double counting.

w = proportion of staff spending on locally produced goods and services. To calculate the proportion of university staff expenditure that is spent in Izmir, results of the sample survey of 80 academic and administrative staff are used. Survey results indicated that 95% of staff expenditure took place inside of the Izmir Metropolitan Area. Thereby, w is estimated as 0.95.

c = the marginal propensity to consume. Data on consumption expenditures and GDP are obtained from The Central Bank of Turkey statistical database, and c is estimated as 0.65. Tugcu

(2004) estimated the parameter *c* as 0.67 in calculating the indirect spending impacts of Nevsehir University on the local economy. Thereby, it is reasonable to conclude that the value of 0.65 for the parameter *c* is consistent with respect to the previous studies. Moreover, it is assumed that marginal propensity to consume calculated using Turkish national data is also valid for the Izmir Metropolitan Area. The results of the regression analysis for calculating the parameter *c* is illustrated in the Appendix.

Therefore:

$$Y_2 = (0.92)(19\ 036) + (0.95)(0.65)(11\ 047) = 24\ 335$$

Second-round Disposable Income

$$D_2 = (1 - t)\ (1 - i)Y_2 \quad (16)$$

$$D_2 = (1 - 0.3)(1 - 0.15)\ (24\ 335) = 14\ 479$$

Third-round Gross Local Output

$$Y_3 = wcD_2 \quad (17)$$

$$Y_3 = (0.95)(0.65)(14\ 479) = 8\ 941$$

Third-round Disposable Income

$$D_3 = (1 - t)(1 - i)Y_3 \quad (18)$$

$$D_3 = (1 - 0.3)(1 - 0.15)(8\ 941) = 5\ 320$$

Fourth-round Gross Local Output

$$Y_4 = wcD_3 \quad (19)$$

$$Y_4 = (0.95)(0.65)(5\ 320) = 3\ 285$$

Fourth-round Disposable Income

$$D_4 = (1 - t)(1 - i)Y_4 \quad (20)$$

$$D_4 = (1 - 0.3)(1 - 0.15)(3\ 285) = 1\ 955$$

Fifth-round Gross Local Output

$$Y_5 = wcD_4 \quad (21)$$

$$Y_5 = (0.95)(0.65)(1\ 955) = 1\ 207$$

(5b) *Fifth-round Disposable Income*

$$D_5 = (1 - t)(1 - i)Y_5 \quad (22)$$

$$D_5 = (1 - 0.3)(1 - 0.15)(1\ 207) = 718$$

Sixth-round Gross Local Output

$$Y_6 = wcD_5 \quad (23)$$

$$Y_6 = (0.95)(0.65)(718) = 443$$

Sixth-round Disposable Income

$$D_6 = (1 - t)(1 - i)Y_6 \quad (24)$$

$$D_6 = (1 - 0.3)(1 - 0.15)(443) = 264$$

Seventh-round Gross Local Output

$$Y_7 = wcD_6 \quad (25)$$

$$Y_7 = (0.95)(0.65)(264) = 163$$

Seventh-round Disposable Income

$$D_7 = (1 - t)(1 - i)Y_7 \quad (26)$$

$$D_7 = (1 - 0.3)(1 - 0.15)(163) = 97$$

Eighth-round Gross Local Output

$$Y_8 = wcD_7 \quad (27)$$

$$Y_8 = (0.95)(0.65)(97) = 60$$

Eighth-round Disposable Income

$$D_8 = (1 - t)(1 - i)Y_8 \quad (28)$$

$$D_8 = (1 - 0.3)(1 - 0.15)(60) = 37$$

Ninth-round Gross Local Output

$$Y_9 = wcD_8 \quad (29)$$

$$Y_9 = (0.95)(0.65)(37) = 23$$

Ninth-round Disposable Income

$$D_9 = (1 - t)(1 - i)Y_9 \quad (30)$$

$$D_9 = (1 - 0.3)(1 - 0.15)(23) = 14$$

Tenth-round Gross Local Output

$$Y_{10} = wcD_9 \quad (31)$$

$$Y_{10} = (0.95)(0.65)(14) = 9$$

Tenth-round Disposable Income

$$D_{10} = (1 - t)(1 - i)Y_{10} \quad (32)$$

$$D_{10} = (1 - 0.3)(1 - 0.15)(9) = 5$$

Eleventh-round Gross Local Output

$$Y_{11} = wcD_{10} \quad (33)$$

$$Y_{11} = (0.95)(0.65)(5) = 3$$

Eleventh-round Disposable Income

$$D_{11} = (1 - t)(1 - i)Y_{11} \quad (34)$$

$$D_{11} = (1 - 0.3)(1 - 0.15)(3) = 2$$

Twelfth-round Gross Local Output

$$Y_{12} = wcD_{11} \quad (35)$$

$$Y_{12} = (0.95)(0.65)(2) = 1$$

Twelfth-round Disposable Income

$$D_{12} = (1 - t)(1 - i)Y_{12} \quad (36)$$

$$D_{12} = (1 - 0.3)(1 - 0.15)(1) = 1$$

Total Gross Local Output FY 2004

Total Gross Local Output (GLO) is equal to the sum of the outputs for each round of spending and is shown on Table 3. IUE is estimated to generate TRY 56.15 million gross local output in the Izmir Metropolitan Area.

Table 3. Estimated gross local output for the Izmir Metropolitan area for the fiscal year 2004 (TRY 000)

	Izmir Metropolitan Area
Round 1	17 683
Round 2	24 335
Round 3	8 941
Round 4	3 285
Round 5	1 207
Round 6	443
Round 7	163
Round 8	60
Round 9	23
Round 10	9
Round 11	3
Round 12	1
Total	56 153

Total Local Disposable Income FY 2004

Total Local Disposable Income (LDI) is to equal to the sum of the incomes for each round of spending, and is shown on Table 4. Izmir University of Economics is estimated to generate TRY 33.94 million local disposable incomes in the Izmir Metropolitan Area.

Table 4. Estimated local disposable income for the Izmir Metropolitan Area for the fiscal year 2004 (TRY 000)

	Izmir Metropolitan Area
Round 1	11 047
Round 2	14 479
Round 3	5 32
Round 4	1 955
Round 5	718
Round 6	264
Round 7	97
Round 8	37
Round 9	14
Round 10	5
Round 11	2
Round 12	1
Total	33 939

Full Multiplier for GLO

This is given as:

$$Y_f / Y_1 = 1 + Y_2 / [1 - wc(1 - t)(1 - i)]\ Y_1 \quad (37)$$

$$= 1 + 24{,}335 / ([1 - (0.95)(0.65)(1 - 0.3)(1 - 0.15)]17\ 683)$$

$$= 3.18$$

where all terms are as previously defined, and Y_f = the final GLO (after all rounds of the multiplier process).

The GLO multiplier of 3.18 means that 1TRY of initial increase (decrease) in the value of Y_1 (labor costs plus University's expenditure in the Izmir Metropolitan Area) gives rise (fall) to TRY 3.18 in gross local output.

The Full Multiplier for LDI

This is given as:

$$D_f / D_1 = 1 + \frac{(1-t)(1-i)Y_2}{[1 - wc(1-t)(1-i)](D_1)} \quad (38)$$

$$= 1 + (1 - 0.3)(1 - 0.15)(24\ 230)/([1 - (0.95)(0.64)(1–0.3)(1– 0.15)](11\ 047))$$

$$= 3.08$$

where all terms are as previously defined, and D_f = the final LDI (after all rounds of the multiplier process).

The LDI multiplier of 3.08 means that TRY 1of initial increase (decrease) in the value of D_1 (first round impact on disposable incomes of local residents) gives rise (fall) to TRY 3.08 in local disposable income.

Expenditure Base Multipliers

Expenditure base multipliers can also be calculated for the University, which are the ratios of Y_f / E and D_f / E.

Local Gross Output Expenditure Base Multiplier

This is given as:

$$Y_f / E = 56\ 153 / 19\ 576 = 2.87 \quad (39)$$

Local Disposable Income Expenditure Base Multiplier

This is given as:

$$D_f / E = 33\ 939 / 19\ 576 = 1.73 \quad (40)$$

When expressed as expenditure base multipliers, TRY 1 of initial University expenditure gives rise (fall) to TRY 2.87 in local gross output and TRY 1.73 in local disposable income.

Basic Keynesian Multiplier

This is given as:

$$k = 1 / [1- wc(1 - t)(1 - i)] \quad (41)$$

$$k = 1 / (1 - (0.95)(0.65)(1 - 0.3)(1 - 0.15)]$$

$$k = 1.59$$

The basic Keynesian multiplier of 1.59, implies that for every TRY 1 gained (lost) to the local economy, a further gross income expansions (reductions) of TRY 1.59 income will be gained (lost) through increases (falls) in expenditure on locally produced gods and services.

Table 5. Effects of the Operation of Izmir University of Economics in the Izmir Metropolitan Area.

	Izmir Metropolitan Area
Expenditure base	19 576
First-round GLO (Y1)	17 683
First-round LDI (D1)	11 047
Second round GLO (Y2)	24 335
Second round LDI (D2)	14 479
Final GLO (Yf)	56 153
Final LDI (Df)	33 939
GLO multiplier	3.18
LDI multiplier	3.08
Expenditure base multiplier (GLO) (Yf/E)	2.87
Expenditure base multiplier (LDI) (Df/E)	1.73
Basic Keynesian Multiplier	1.59

Both the GLO multiplier and LDI multiplier are greater than the basic multiplier as expected, since the University attracts additional expenditures particularly from students. Table 6 illustrates the multipliers estimated by Lewis (1988) for Wolverhampton Polytechnic, Bleaney *et al.* (1992) for Nottingham Univesity, Armstrong *et al.* (1994) for Lancaster University, and Huggins and Cooke (1997) for Cardiff University. The basic multiplier estimated for Izmir University of Economics is greater than the basic multipliers estimated by Lewis (1988), Bleaney *et al.* (1992), and Huggins and Cooke (1997).

Table 6. Estimated Multipliers from Previous Studies

	Basic multiplier	GLO multiplier	LDI multiplier	GLO expenditure base multiplier	LDI expenditure base multiplier
Lewis (1988)	1.027	-	-	-	-
Bleaney et al. (1992)	1.059	1.259	1.561	1.021	0.162
Armstrong et al. (1994)	-	-	-	0.87	0.439
Huggins and Cooke (1997)	1.15	1.51	1.45	1.13	0.61

Source: Lewis (1988), Bleaney et al. (1992), Armstrong et al. (1994), Huggins and Cooke et al. (1997).

There are some differences in the tax rates, marginal propensity to consume and proportion of University services sourced locally in these studies. However, the principal difference results from the assumed values of *v* and *w*. Lewis (1988) set these variables both at 0.1, Bleaney *et al.* (1992) set them at 0.43 and 0.22 and Huggins and Cooke (1997) assigned them 0.58 and 0.28 respectively. Compared to these low values of v and w in the previous studies, this study assigns high values of 0.92 and 0.95 respectively. This fact is mainly due to the definition of the geographical study area in our case study. As Beck *et al.* (1995) emphasize, the broader the geographical area in the economic impact study, the greater will be the proportion of university vendor contracts and employees' and students' expenditures included in the direct economic impact, and the higher will be the estimated multiplier. Therefore, the multiplier values estimated in this study for the Izmir Metropolitan Area are reasonable when the broadness of the geographic area is considered. However, if the area included in this study had been restricted to Balcova district only, rather than the Izmir Metropolitan Area, then the estimated multipliers would have been lower.

7. Conclusion

This study has shown that it is possible to estimate fairly accurately the direct and induced impacts of a university on its region by using a previously developed and refined model. Results of the case study indicates that in the Spring semester of the academic year 2003-2004, the University created 372 jobs, of which 142 are full-time academic, 177 are part-time academic, and 53 are administrative staff positions. In the Fall semester of the academic year 2004-2005, the University created 444 jobs, of which 198 are full-time academic, 180 are part-time academic, and 66 are administrative staff position.

Induced effects on income are estimated after 12 rounds of estimation. Total gross local output is estimated as TRY 55.65 million and total local disposable income is estimated as TRY 33.63 million. Five different multipliers are calculated. Gross local output multiplier is estimated as 3.18, meaning that TRY 1 of initial increase (decrease) in the value of income defined as labor costs plus University's expenditure in the Izmir Metropolitan Area gives rise (fall) to TRY 3.18 in gross local output. Local disposable income multiplier is estimated as 3.08, meaning that TRY 1 of initial increase (decrease) in the value of disposable income defined as the first round impact on disposable incomes of local residents gives rise (fall) to TRY 3.08 in local disposable income. Gross local output expenditure base multiplier and local disposable income expenditure base multiplier are estimated as 2.87 and 1.73 respectively, meaning that TRY 1 of initial University expenditure gives rise (fall) to TRY 2.87 in local gross output and TRY 1.73 in local disposable income. Finally, the basic Keynesian multiplier is estimated as 1.59, implying that for every TRY 1 gained (lost) to the local economy, a further gross income expansions (reductions) of TRY 1.59 income will be gained (lost) through increases (falls) in expenditure on locally

produced goods and services. Given that all of the estimated multipliers are greater than 1, it is reasonable to conclude that Izmir University of Economics is a major business that contributes substantially to direct and induced income generation in the Izmir metropolitan economy.

References

Arik M, Nsiah C. 2004. *Measuring the economic impact of Middle Tennessee State University.* Middle State Tennessee University, Murfreesboro, Tennessee.

Armstrong HW. 1993. The local income and employment impact of Lancester University. *Urban Studies.* 30:10, 1653-1668.

Armstrong HW, Darrall J, Grove-White R. 1994. Building Lancester's future: economic and environmental implications of Lancester University's expansion to 2001, University of Lancester, Department of Economics and Center for the Study of Environmental Change.

Armstrong HW, Taylor J. 2000. *Regional economics and policy,* 3rd ed. Blackwell, Oxford.

Atik H. 1999. Üniversitelerin yerel ekonomiye katkıları: teori ve Erciyes Üniversitesi üzerine bir uygulama. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 15, 99-109.

Bleaney MF, Binks MR, Greenaway D, Reed GV, Whynes DK. 1992. What does a university add to its local economy? *Applied Economics.* 24:3, 305-311.

Carroll MC, Smith BW. 2006. Estimating the economic impact of universities: the case of Bowling Green State University. *The Industrial Geographer.* 3:2, 1-12.

Erkekoglu H. 2000. Bölge üniversitelerinin yerel ekonomiye katkıları: Sivas Cumhuriyet Üniversitesi örneği. *Erciyes Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*. 16, 211-230.

Görkemli HN. 2009. Selçuk Üniversitesi'nin Konya kent ekonomisine etkileri. *Selçuk Üniversitesi Sosyal Bilimler Enstitüsü Dergisi.* 22, 169-186.

Huggins R, Cook P. 1997. The economic impact of Cardiff University: innovation, learning and job generation. *Geojournal.* 41:4, 325-337.

Lantz VA, Brander JRG, Yigezu YA. 2002. *The Economic Impact of the University of New Brunswick: Estimations and Comparisons with Other Canadian Universities*. A Report submitted to the Office of the Vice President (Academic). University of New Brunswick.

Lewis, JA. 1988. Assessing the effect of the Polytechnic, Wolverhampton on the local community. *Urban Studies* 25:1, 53-61.

Tugcu, C.T. 2004. *Üniversitelerin yerel ekonomik faaliyet hacmine katkıları:* Nevşehir örneği. (10/04/2005).

Appendix:

Estimation of the Marginal Propensity to Consume

The marginal propensity to consume for Izmir Metropolitan Area has been estimated using a simple regression model.

$$C_t = b_0 + b_1 Y_t \qquad (A1)$$

where C_t is real private consumption expenditures and Y_t is real gross domestic product measured at factor prices.

Data used in the regression is for the period 1987:1-2004:4. The data is extracted from The Central Bank of Turkey database. The model is estimated using OLS. First, the series are adjusted for seasonality effects and then, tested for stationarity using Augmented-Dickey Fuller (ADF) test. Table A1 illustrates the ADF test results for real private consumption expenditure and real gross domestic product.

Table A1. ADF Test Results for Seasonally Adjusted Real Private Consumption Expenditures

Variables	ADF Test Statistic at Level	ADF Test Statistic at first difference	MacKinnon critical value at 5% significance level
C	-1.380261	-8.83061	-2.9035
Y	0.010531	-6.726485	-2.9035

At 5% significance level, the ADF test results indicate that the null hypothesis that the variables have a unit root cannot be rejected for both series, meaning that they are not stationary. Next, they are tested for stationarity at first difference. The ADF test results indicate that both series are stationary at 5% significance level, implying that they are integrated of order 1.

Afterwards, the regression model is estimated and corrected for autocorrelation. The regression results are captured in equation (17). Table A2 summarizes the regression results.

$$CSA_t = 670.86 + 0.65YSA_t + 0.79\ AR(2) \qquad (A2)$$

where CSA_t is seasonally adjusted real private consumption expenditure and YSA_t is seasonally adjusted real gross domestic product.

Table A2. Regression Results for Seasonally Adjusted Series

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent var= CSA				
Constant term	670.8572	1056.658	0.634886	0.5277
YSA	0.647318	0.037187	17.40722	0.0000
AR(2)	0.79139	0.092493	8.556176	0.0000
R-squared	0.967479			
Durbin-Watson stat	1.701006			
Adjusted R-squared	0.966508			
F-statistic	996.6056			

Next, the residual series obtained from the regression are tested for unit root. The ADF test results are presented on Table A3. Both series are stationary at I(1) level. Finally, the stationarity of the residual series are tested and results are reported on Table A3.

Table A3: ADF Test Results for the Residual Series

Variables	ADF Test Statistic at Level	ADF Test Statistic at first difference	MacKinnon critical value at 5% significance level
R	-4.903336	-13.84235	-2.9048

At 5% significance level, the ADF test results imply that the null hypothesis that the residual series has a unit root can be rejected. The residual series is stationary. To determine the long run relationship between the two variables, the below regression is estimated. Table A4 summarizes the regression statistics.

$$\Delta CSA_t = -8.3407 + 0.6526\Delta YSA_t - 0.2597u_{t-1} - 0.91AR(1) \qquad (A3)$$

Table A4. Regression Results for the Cointegration Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Dependent var= CSA				
Constant term	-8.340671	31.81352	-0.262174	0.7940
D(YSA)	0.652637	0.041022	15.90936	0.0000
RESID01(-1)	-0.259678	0.093536	-2.776244	0.0072
AR(1)	-0.911101	0.06661	-13.67812	0.0000
R-squared	0.821007			
Durbin-Watson stat	1.497468			
Adjusted R-squared	0.812617			
F-statistic	97.85202			

The coefficient of u_{t-1} is expected to be between 0 and –1 and statistically significant. The coefficient of u_{t-1} satisfies these conditions. Therefore, it is reasonable to conclude that in the long run, error correction mechanism works and the regression results are reliable in the long run.

Marginal propensity to consume is calculated as:

$$mpc = \Delta C / \Delta Y \qquad (A4)$$

Therefore, the estimate of ΔYSA_t, 0.65 is the marginal propensity to consume.